

Application No.: 10/007,502
Amendment dated: September 29, 2003
Reply to Office Action of April 29, 2003

b.) Remarks

Claims 1-15 are pending in this application. Claim 1 has been amended in various particulars as indicated hereinabove. New Claim 15 has been added to alternatively define Applicant's invention.

Claim 1 was amended to add that mechanically polishing the surface of the substrate is for modifying the features to produce a curved optical surface of the optical element as discussed in the fourth paragraph of the Summary of Invention, for example.

Turning to the Office action, clarification is requested. The first paragraph mentioned that the "optical element substrate is interpreted as semiconductor wafer comprising silicon." Applicant notes that, in one embodiment, the silicon wafer is used as the substrate. Claim 1, however is not limited to silicon wafer material as the only type of substrate. New claim 15 is added to clarify this interpretation of the claim, which now lists two possibilities.

Turning now to the merits, claims 1, 4, 5, 8, 9, and 11-14 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5,958,794 to Bruxvoort, *et al.* (hereinafter the Bruxvoort patent) in view of U.S. Pat. No. 6,166,372 to Yamamoto, *et al.* (hereinafter the Yamamoto patent). In related rejections, claims 2, 3, 6, and 7 were rejected in further view of U.S. Pat. No. 6,309,900 to Maury, *et al.* (hereinafter the Maury patent) and claim 10 was rejected in further view of U.S. Pat. No. 4,451,119 to Meyers, *et al.* (hereinafter the Meyers patent). These rejections are respectfully traversed for the following reasons.

Some background information concerning the present method may be helpful to understand the claims. The invention relates to a technique for fabricating the required surface shapes for optical elements, such as curved micro mirrors and lenses. Starting with a simple, binary for example, approximation to the desired surface shape, polishing, e.g., chemical mechanical polishing (CMP), is used to form the smooth optical surface. Specifically, starting with a mesa or blind hole with a mesa profile, a smooth mirror or lens structure can be fabricated.

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The Bruxvoort patent concerns the wafer planarization processes that are used when manufacturing integrated circuits. Often the wafers are polished between successive deposition steps in order to improve the quality of the subsequent layer.

In contrast, the Yamamoto patent concerns an integrated polarization detector that uses a prism coupler 10, a waveguide, a splitter, and detectors. The prism coupler is implemented as a block formed on the device. The waveguides are implemented as layers in the device.

Neither of these references shows or suggests a method for fabricating optical elements, in which topographic features are formed on a surface of an optical element substrate, mechanically polishing the surface of the substrate to modify the features and thereby produce the curved optical surface of the element, and dicing the substrate into the optical elements. The Bruxvoort patent merely concerns polishing. The Yamamoto patent concerns optical element fabrication, albeit by a different process.

Further, neither the Maury patent nor the Meyers patent undermines the novelty of the claimed combination of method steps in which polishing is used to produce optical elements.

Moreover, none of the reference suggests the fabrication of elements by polishing followed by the optical coating as in claims 9-11.


For these reasons, Applicant requests withdrawal of the rejections.

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Applicant believes that the present application is in condition for allowance. A Notice of Allowance is respectfully solicited. Should any questions arise, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

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